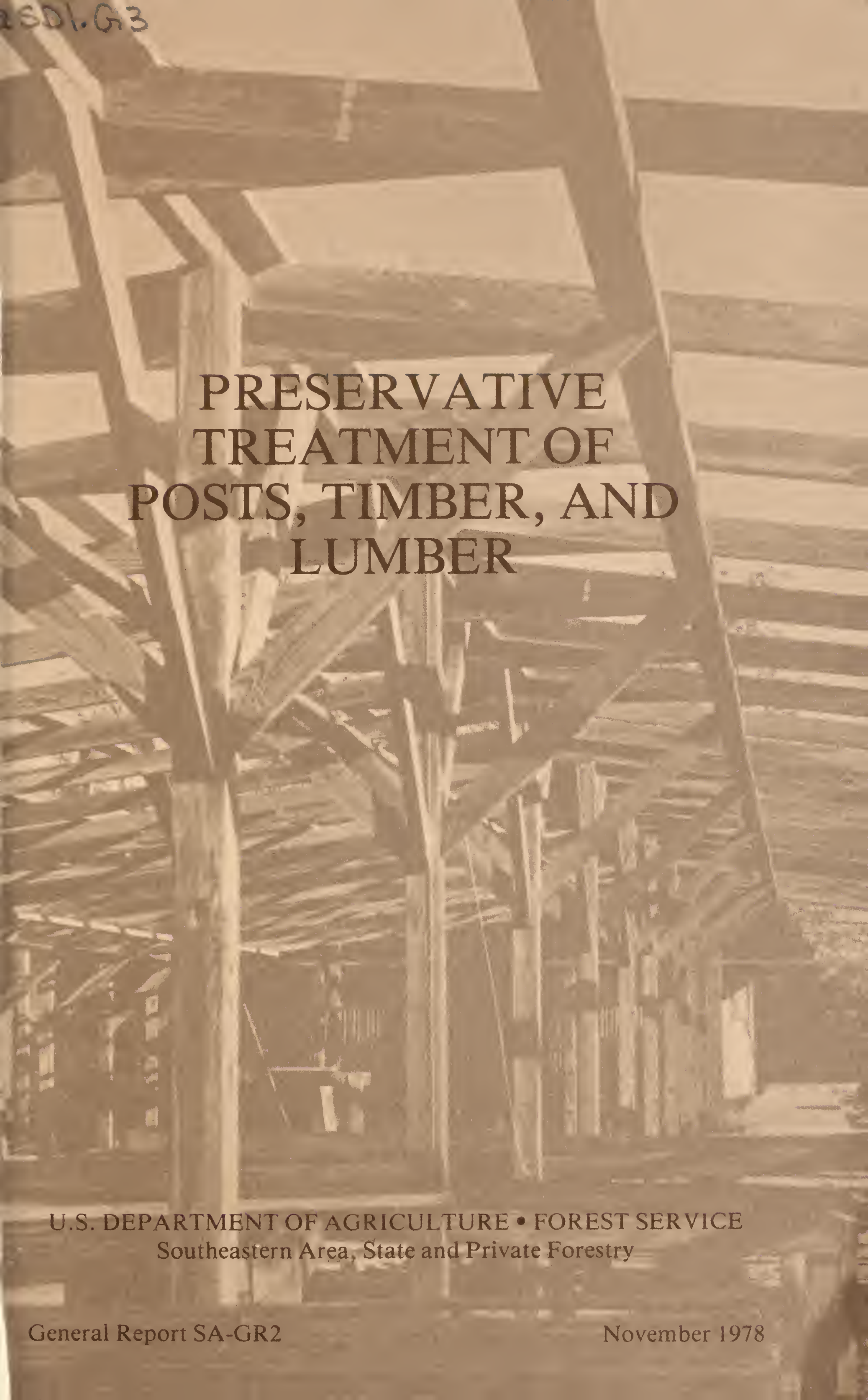

PRESERVATIVE TREATMENT OF POSTS, TIMBER, AND LUMBER

U.S. DEPARTMENT OF AGRICULTURE • FOREST SERVICE
Southeastern Area, State and Private Forestry

General Report SA-GR2

November 1978

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Trade names are used in this publication solely to provide specific information. Mention of a trade name does not constitute a warranty of the product by the U.S. Department of Agriculture or an endorsement by the Department over other products not mentioned.

Cover photo by Thomas E. Ridgway, Osmose Co., Griffin, Ga.

PRESERVATIVE TREATMENT OF POSTS, TIMBER, AND LUMBER

by
Robert L. Little[1], Francis G. Wagner, Jr.[2], and Harold O. Beals[3]

THE NATURAL ENEMIES OF WOOD

Under proper conditions, wood can last for centuries. Wood has been known to last for thousands of years when protected from its natural enemies. Much of the wood uncovered during exploration of the pyramids is as sound today as it was during the days of the ancient Egyptians.

Wood inhabiting fungi and insects are the chief enemies of wood. Under extreme conditions, these agents can completely destroy wood in less than a year. Some types of fungi, including molds, and sapstain, do little more than damage the appearance of wood. But other types of fungi known as wood decay agents, attack the structural tissues of wood. Wood decay can cause a solid piece of wood to crack, shrink, crumble, and dissolve. Of the wood inhabiting insects, subterranean termites are by far the most destructive. They exist worldwide in all but the coldest climates. Termites attack and weaken wood by literally eating the entire wood substance.

Like other living organisms, wood decay fungi and termites have basic biological needs. These basic needs include: air, proper temperature, moisture, and food. Eliminate any one of these items and decay and termites cannot live. For most wood in use, it is almost impossible to do much with temperature or air supply. This is true because wood is used close to people. Decay fungi and termites are comfortable at the same temperature and with the same air supply as people.

How to Protect Wood From Decay and Insects

The most effective way to control decay is to eliminate wood moisture. Much of the wood used today in houses and other structures is effectively protected from damage because

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the wood remains dry. The wood used in the pyramids has remained sound for thousands of years because it lacked sufficient wood moisture to support decay fungi.

Subterranean termites live in the soil and bring their moist environment to wood that would otherwise be dry. Therefore, protecting wood from moisture will not necessarily prevent termite attack. A good way to protect wood from subterranean termites is to provide a chemical barrier between the wood and the soil. Soil treatment with a registered chemical will protect dry wood above the treated soil for 20 years or more.

The last alternative for the control of damage is to eliminate the food source. Wood can be made toxic to decay fungi and termites through preservative treatment. Good preservative treatment can extend the life of wood to 30 years or more even when wood is used under the most hazardous conditions.

Treated wood should be used whenever wood is in contact with the soil, directly on a concrete slab, in water, or in a location where it frequently gets wet. Probably the greatest hazard to wood is where it is used in contact with the soil. Wood at the soil surface or just below the ground line remains at an optimum moisture level for attack by decay and termites. Wood used above ground, but exposed to rainfall, is much more variable in its vulnerability to damage by wood-destroying agents. Aboveground damage is determined by such factors as volume of rainfall, temperature, amount of drying weather, type of structure, amount of exposed end-grain, and many other factors.

PRESERVATIVES

Chemicals used in wood preservation may be divided into two broad classes. This division is based on the material in which the preservative is dissolved. These solvents are referred to as the carriers. Two principal types of carriers are used: petroleum oil and water. Whether oil or water is used depends on which can best dissolve the preservative and carry it into the wood. Following is a brief description of some of the more widely used wood preservatives. They are broken down by carrier type. For a summary of these characteristics, see table 1.

*TABLE 1. — Summary of preservative characteristics**

Preservative		Characteristics							
		Paintability	Color	Odor	Intimate contact with plants	Intimate contact with animals	Handling characteristics	Indoor use	Effectiveness in preventing attack
Creosote		NR	brown to black	P	NR	NR	P	NR	E
Penta in	Light oil	V	tan	V	NR	NR	V	NR	E
	Heavy oil	NR	brown	P	NR	NR	P	NR	E
Waterborne treatments (CCA)**		E	green	E	G	F	G	G	E
Copper naphthenate		F	green	P	V	V	G	F	F

Legend

E- excellent, G - good, F - fair, P - poor, V - variable, NR - not recommended

*These characteristics are for treated wood following 3 months of storage or service.

**When oil based paints are used, water-borne preservative treated wood must be dried before painting.

Oil Type

Creosote

Several types of creosote are widely used. All creosote preservatives have several advantages and disadvantages:

ADVANTAGES
- Highly toxic to wood-destroying organisms.
- Insoluble in water; therefore, it won't leach.
- Penetration into wood is easily determined because of creosote's dark color.
- Makes treated wood more resistant to weathering.

DISADVANTAGES
- Turns wood dark brown to black.
- Oily appearance and odor.
- Plants and animals (including some humans) are sensitive to its vapors.
- Because of its oily, disagreeable nature, creosote-treated wood cannot be painted, used near open fire or flame, or where plants or animals will be in close contact with it.

Creosoted wood is frequently used where a high degree of protection is needed at a relatively low cost and appearance is not important, e.g., utility poles, crossties, and fence posts.

Creosote, because of its thick, oily nature, is best applied via a pressure treatment. Brush application is possible when the creosote is thinned with a light oil such as diesel fuel or mineral spirits. Brush it on only as a spot treatment when pressure treated material must be cut and untreated wood is exposed.

Pentachlorophenol

Pentachlorophenol is commonly referred to as penta or PCP. Penta-treated wood varies in color, depending on the type of oil that is used as a carrier; the heavier oils will darken the wood. Advantages and disadvantages of penta are as follows:

ADVANTAGES
- Highly toxic to wood-destroying organisms.
- Insoluble in water; therefore it won't leach.
- When a light oil carrier is used, the treated wood may be painted or stained.
- Penetrates wood readily.
- May be used in conjunction with water repellents.

DISADVANTAGES
- Toxic and irritating to plants, animals, and humans.
- Difficult to mix when used in the dry state.
- Heavy oil carriers have a disagreeable odor which lingers.
- Tends to migrate in wood, especially when heated.
- The heavier the weight of the oil carrier, the more difficult it is to paint the treated wood.
- Not recommended for marine use where wood contacts salt water.

Pure penta is a powder. When mixed with a carrier of heavy oil, the properties of penta-treated wood are similar to those of creosote. When a light oil carrier is used, the treated wood has little odor, is similar in color to untreated wood, and can usually be painted or stained. Where

a completely clean surface is needed, wood can be treated with a mixture of penta in liquified petroleum gas (LPG). During the treating process, the LPG is flashed off leaving only the penta in the wood. The treated wood is clean, dry and will accept any type of finish. A new waterborne penta process has been developed. The process holds great promise and the wood has properties similar to penta in LPG. Penta-treated wood is most often used for lumber, utility poles, and fence posts. *Wood treated with penta should not be used in enclosed areas that are not well ventilated. Also, penta-treated wood should not come in contact with plants or food.*

Virtually all commercial treatments employ a pressure process. Pressure application gives by far the best performance for the least cost. When small amounts of treated wood are needed, penta may be applied via soaking, dipping, or brushing. For the small user, penta is available in a concentrated form. It may be diluted using a light petroleum oil.

Copper Naphthenate

This bright green, oily material has been used as a wood preservative for many years. Copper naphthenate is most frequently applied by the user; it is very seldom used in pressure treating processes. Copper naphthenate is available at retail stores in either a ready-to-use or a concentrated form. Mix the concentrate according to the directions on the label.

ADVANTAGES

- Not toxic to plants.
- Usually does not irritate users' skin.
- Readily available.
- Easily applied by home treatment methods.
- Green color shows extent of treatment.

DISADVANTAGES

- Its bright green color frequently bleeds through finishes, making it difficult to cover.
- Has a somewhat objectionable odor.
- Usually costs more than penta or creosote.
- Not as toxic to decay fungi and termites as penta or creosote.
- Not available in pressure treated form.

Because it is less toxic than penta or creosote to humans and plants, it is a good choice for the home applicator. Application methods available to the user include spray, brush, dip and soak, with soaking being the most effective.

Waterborne

The vast majority of waterborne preservatives are applied via pressure treatment methods. The normal process for treating involves pressure impregnating dry wood with the waterborne preservative. After treating, some firms do not re-dry the wood before it is sold. If the user purchases wet wood, the water used in the treating process must dry while the wood is in service. Wood that is re-dried is lighter, less subject to surface mold growth, and doesn't warp as

badly in service. Many types of waterborne preservatives are available. Some of the more common types are listed in table 2.

By far the largest amount of waterborne preservatives currently in use are of the Types II and III of chromated copper arsenate (CCA). The advantages and disadvantages of these CCA's are as follows:

ADVANTAGES

- Toxic to wood-destroying organisms.
- Paintable, clean, and odorless.
- Will not leach in the presence of water.
- Readily available in pressure-treated form.

DISADVANTAGES

- If the treated wood is wet when put into service, it may warp or twist. For this reason, wood should be kiln or air dried before use.
- Not available for non-pressure application.
- Does not prevent weathering of wood.

CCA, while very effective against decay and termites, may allow the growth of surface molds. This mold growth occurs during periods of favorable weather conditions where tightly stacked piles of treated wood are still wet. Because the preservative is fixed in the wood, free water and wood sugars at the surface act as a growing medium for fungi. Although this mold growth is only active on the surface and in no way reduces the strength or life of the wood, it is unsightly. Users may mistakenly think that the wood has been improperly treated. To alleviate this problem some companies apply a surface mold preventative chemical to CCA-treated wood or incorporate a mildewcide during the treating process.

CCA-treated wood has a light greenish tint when first put in service; this fades after a period of weathering. CCA-treated wood is the most acceptable treated wood used around the house. Treated wood may be used for plant boxes, greenhouses, decks, and even foundations.

Table 2.—Waterborne Preservatives

Chemical name	*Abbreviation*	*Some common trade names*
Acid copper chromate	ACC	Celcure
Ammonical copper arsenite	ACA	Chemonite
Chromated copper arsenate	CCA	
Type I or Type A		Greensalts or Erdalith
Type II or Type B		Osmose K-33 or Boliden K-33
Type III or Type C		Wolman CCA, Osmose K-33
Chromated zinc chloride	CZC	None
Fluor-chrome-arsenate-phenol	FCAP	Wolman Salts or Osmosalts
Sodium pentachlorophenate	Sodium PCP	Dowicide G

APPLICATION METHODS

Pressure Treated Wood

Pressure treatment is the most widely used method to preserve wood. About 90 percent of all preserved wood is treated by some type of pressure process, and almost all commercially treated wood is pressure treated. Because of the high cost of the necessary equipment, pressure treatment is not practical for use at the home.

Quality Standards

Many commercial wood preserving companies treat according to the industry standards set by the American Wood Preservers Association (AWPA). AWPA has issued standards which specify the types, quantities, qualities, and penetration of preservative needed to protect wood for different uses. Service records show that wood treated according to standard and used properly will last for 30 years or more.

Unfortunately, it is not possible to determine by visual inspection whether or not a piece of wood has been properly treated. Therefore, select pressure-treated wood marked with a quality stamp. The quality stamp indicates that the treated wood was produced to meet strict quality control standards. Inspectors carefully sample the treated wood to insure these standards are met. Creosote and penta treated wood usually do not carry a quality stamp, but may be branded or tagged. In any case, ask for proof that the wood was treated to standard. The quality stamp or proof of treatment should contain: identity of the treating company, identity of the treating plant, preservative used, standard to which the wood was treated, and the name of the supervising quality control agency. (See figure 1.)

Before purchasing treated wood, determine where the wood will be used. Treated wood used improperly may not last any longer than untreated wood. For example, more preservative is needed to protect wood used in contact with the ground than wood above ground. If wood treated for aboveground use is put in contact with the ground, extensive damage to the wood can be expected in just a few years. Table 3 lists the recommended AWPB treatment standards for selected uses of pressure- treated wood. Most of the selected use categories list more than one suitable standard. In these cases, wood treated to any of the listed standards will give good service. However, the physical characteristics of the treated wood (i.e., odor, appearance) will vary with the type of preservative. The AWPB quality stamp shows the standard to which the wood was treated. Be sure to match the correct treatment standard to the intended use.

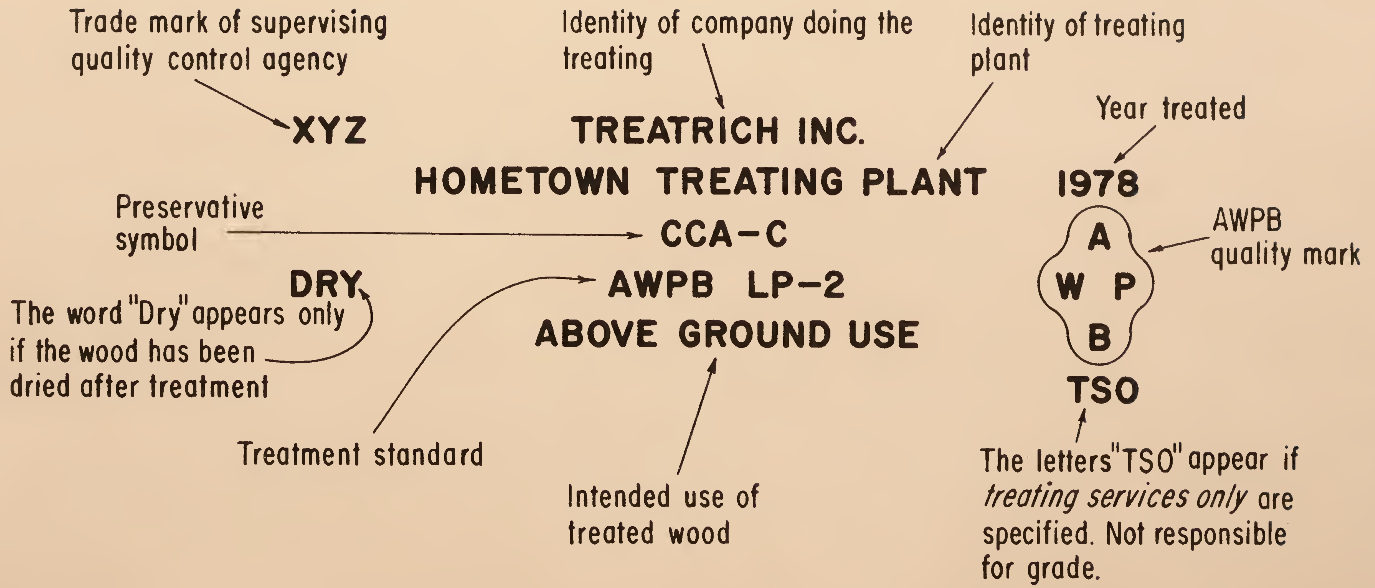


FIGURE 1.—AWPB QUALITY STAMP

Table 3. —Recommended AWPB treatment standards for selected uses of pressure treated wood[1]

ABOVE GROUND USES (at least 8 inches above ground)	SUITABLE STANDARDS[2]				
Facia boards	LP2	LP3	LP4		
Sills	LP2	LP3	LP4	LP5	LP7
Plates in contact with masonry	LP2	LP3	LP4	LP5	LP7
Floor joists, subflooring (closer than 18 inches to ground)	LP2	LP3	LP4		
Exterior balcony or porch framing and floors	LP2	LP3	LP4		
Fence rails, pickets or cross members	LP2	LP3	LP4	LP5	LP7
Exterior steps (*except* portions in contact with the ground	LP2	LP3	LP4		
Picnic tables (*except* portions in contact with the ground)	LP2	LP3	LP4		
GROUND CONTACT USES					
Fence posts	LP22	LP33	LP44	LP55	LP77
Structural members imbedded in concrete	LP22	LP33	LP44	LP55	LP77
Exterior steps (portions in contact with the ground)	LP22	LP33	LP44		
Picnic tables (portions in contact with the ground)	LP22	LP33	LP44		
Marina structures in contact with fresh water	LP22	LP33	LP44	LP55	LP77
FOUNDATIONS					
Residential and light foundations in ground contact	FDN				
MARINE USES					
Softwood lumber, timber, and plywood for saltwater use	MLP				

LEGEND

LP2, LP22, FDN	Pressure treated with waterborne preservatives.
LP3, LP33	Pressure treated with light petroleum solvent-penta solution.
LP4, LP44	Pressure treated with volatile petroleum solvent (LPG) penta solution.
LP5, LP55	Pressure treated with creosote or creosote coal tar solutions.
LP7, LP77	Pressure treated with heavy petroleum solvent-penta solutions.
MLP	Pressure treated with waterborne preservatives, creosote, or creosote coal tar solutions.

Note: Wood pressure treated with heavy petroleum solvent-penta solutions, creosote, or creosote coal tar solutions is generally **not** paintable.

[1]Sources: SFPA *Wood Preservation*, and AWPB Standards.

[2]Double number designations denote ground contact use.

Non-Pressure Treatments

Non-pressure treatments are usually applied with simple equipment. In practice, however, some non-pressure treatments may rival pressure treatments in the complexity of the process. Several treatments are described below.

Brush, Spray, and Dip Treatments

Preservatives are frequently applied by brush or spray. This treatment is of little or no value for wood in contact with the soil. Also, it is of questionable value for other applications because of very shallow penetration of the preservative into the wood. Repeated applications of preservatives by these means may increase the penetration somewhat, but normally not over .03 inches (.76 mm). Checks in the surface usually expose untreated wood, making it susceptible to decay.

Dipping in preservative materials will protect wood that has many exposed cut, end-grain surfaces. Dip treatments are used extensively in applications such as window and door manufacture. For general use, however, dips are little better than brush or spray treatments and should not be used for wood that will come in contact with the ground.

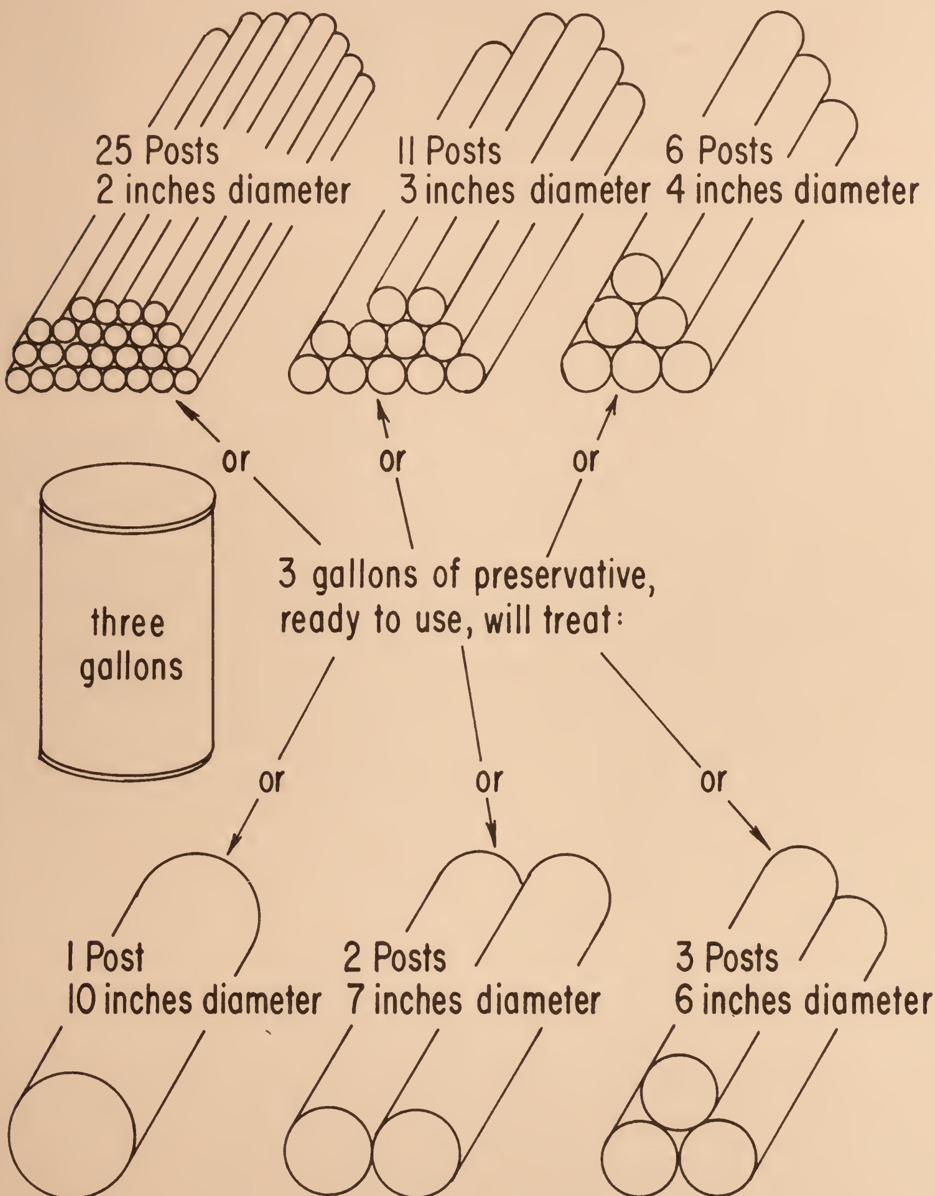
Cold Soaking

Preservative materials penetrate dry wood to a greater depth in soaking or steeping (prolonged soaking) treatments than in any of the non-pressure methods described earlier. Cold soaking for 24 hours to 2 weeks gives maximum penetration and retention. Longer soaking normally will not result in better treatment. This method gives good results with seasoned material. A substantial increase in service life over that of untreated wood can result when wood is properly treated by the cold soak method. One disadvantage of the process is that there is little control over the amount of preservative retained in the wood. Many times, the amount of preservative in the wood is excessive, resulting in high treating costs.

Follow these steps to select and treat fence posts by the cold soaking method:

1. Select a species of wood that is easily treated. Any of the southern pines, red oak, black gum, or green ash are acceptable. Always use the smallest size timber that will satisfy your needs, as shown in figure 2.
2. Choose posts with large amounts of sapwood. Sapwood treats more easily than heartwood. Also, select posts that are free of decay to insure the durability after treatment.
3. Peel the bark from the posts as soon as possible after they are cut. This will allow the posts to dry and treat more easily. Use a mechanical peeler, draw knife, hoe (spud), or shovel to remove the bark.
4. Dry the posts in stacks that permit air to circulate freely. A crisscross pattern (crib) with layers in opposite directions, works well for drying posts. Elevate the first layer at least 1

FIGURE 2.—MORE POSTS PER GALLON OF PRESERVATIVE CAN BE TREATED WHEN USING SMALLER POSTS (EACH IS 6 FEET LONG)



*From *Fence Post Treating*, by E. M. Conway and R. L. Schnell. Division of Forestry Relations, Tennessee Valley Authority, August 1952.

foot (30 cm) above the ground on preservative-treated wood, concrete blocks, or other non-wood items. The posts should dry at least 90 days in the summer and longer in the winter.

5. Sort the posts for treatment according to diameter and species. Posts of different species and diameter require different treatment schedules. The diameter and length of each post determines the amount of preservative needed to treat the post to a given preservative retention. Table 4 lists the volume of preservative needed to treat various sized posts to an average retention of 8 pounds per cubic foot (128 kg/m^3).
6. Choose a treating tank that is large enough to hold the number of posts that you would like to treat and the preservative. Place the posts in the tank and weight them to keep them from floating.
7. Barely cover the posts with preservative. Then add the additional amount of preservative needed to treat the posts as determined from table 4.

Table 4.—Solution required to treat round fence posts to an average retention of 8 lb/ft^3 (128 kg/m^3).[1]

Diameter of posts midway between the two ends	Preservative needed for posts 6, 7, and 8 feet long		
	6	7	8
Inches		*Pints*	
3	2.5	3.0	3.5
4	4.0	5.0	6.0
5	6.5	7.5	9.0
6	9.5	11.0	12.5

[1]Source: *Fence Posts for Farm and Garden*, by M. P. Levi. The North Carolina Extension Service, Folder 320, 1974.

8. Soak the posts in the tank until the preservative level returns to the top surface of the posts. This may take from 24 hours to a week.
9. Remove the posts from the tank and drain so that excess preservative on the surface of the posts will go back into the tank.

Hot and Cold Baths

One of the best non-pressure treatments is the hot and cold bath. In this process, the wood is heated either in water or preservative, at a temperature of 180°F to 220°F (82°C - 104°C) for 1 to 3 hours. The temperature should not exceed 220°F (104°C). Following the hot bath, the posts are quickly transferred to a "cold" tank of preservative to remain for an hour or more until good penetration of the sapwood is obtained. The "cold" tank is maintained at a temperature of 100°F (38°C), or warm enough to liquify and thin the oil. The level of preservative should be watched closely during the cooling period as it will be absorbed quickly into the hot wood. Another method is to turn off the heat from the hot bath and let the posts and preservative cool together; this requires only a single tank.

Penetration of the preservative is usually good in the hot and cold process and retention can be as high as 30 pounds per cubic foot (481 kg/m^3). This treatment does not give the control or penetration and retention that can be obtained in a pressure process, but some control can be exercised by shortening or lengthening the time in the cold bath. Best results are obtained with thoroughly dry wood. Because of the cost and complexity of the equipment, this process is best

suited to use by groups or individuals who want to treat large amounts of wood.

The Double Diffusion Method

This treatment soaks green wood in one chemical in a water solution and then soaks the wood in a second solution containing another chemical. The chemicals diffuse into the wood and combine to form an insoluble compound that is highly resistant to leaching (washing out). For example, posts may be soaked in a solution of copper sulfate for a few days and then in a solution of sodium chromate for a few days. This procedure deposits insoluble copper chromate in the wood.

COST AND DURABILITY

Treated wood generally costs more than untreated wood. The cost ranges from about 1½ to 2 times the cost of untreated wood, depending on the treatment and the preservative used. This higher initial cost must be weighed against replacement costs of wood structures which become unserviceable. Untreated wood exposed to conditions of decay may have a service life of less than 5 years before replacement is required. Properly treated wood in the same position should last for 30 years or more.

The cost of the replaced part may be minimal when considering labor costs required for installation. Structures such as buildings, foundations, bridges, etc., have members which are not only difficult to inspect but are costly to replace. Parts which are not readily accessible for inspection must have a long life.

OTHER CONSIDERATIONS

Fastening Treated Wood

As with untreated wood, wood that has been treated with a preservative can be fastened to wood or other materials by glue or metal fasteners. Take care when fastening treated wood to insure that the preservative and the fastening method are compatible.

Glues

As a general rule, gluing is more satisfactory when waterborne preservatives are used. Moderate success may be achieved with some of the oil-borne preservatives provided that the carrier dries completely before gluing. This drying is greatly aided by using only light-weight oils as carriers; heavy oils make treated wood practically nongluable. To eliminate any deposits on the surface of treated wood, the wood should always be sanded or planed before gluing.

Metal Fasteners

Water is the primary cause of corrosion (rusting) in metal fasteners.

Corrosion-prone metal fasteners can be used more satisfactorily in wood that has been treated with an oil-borne preservative rather than one which is waterborne. Corrosion problems can be minimized by only using dry wood and by keeping the wood as dry as possible once it is in service. Oil-borne preservatives tend to repel water as well as provide an unfavorable chemical environment for corrosion. Waterborne preservatives, on the other hand, add water during the treating process and are themselves corrosive. For this reason, it is helpful to re-dry wood treated with a waterborne preservative.

Some species of wood contain natural acidic extractives. Redwood and the cedars are good examples of woods of this type. While these acidic extractives corrode fasteners, they also help to give these species a natural resistance to attack by wood-destroying organisms.

Regardless of the reasons for corrosion problems, if they exist, use fasteners not subject to corrosion. In aboveground application, hot-dip galvanized hardware may be sufficient. Below ground, however, use fasteners made of copper, stainless steel or silicon bronze.

Weakening of a union fastened with corrosion-prone metal fasteners is an accelerating process. The fasteners lose strength due to corrosion. As the products of the corrosion move into the surrounding wood, further weakening results. This loss in wood strength promotes the entrapment of water around the shank of the fastener, which increases the rate of corrosion.

Touchup of Cuts in Treated Wood

Most application methods furnish a shell of preservative protection. Depending on the treating method and preservative used, this shell varies in thickness. Wood exposed to breaks in the shell is just as subject to attack by wood-destroying agents as if it were not treated at all. For this reason, take care to restore the shell's integrity whenever treated wood is cut or bored. This may be done in a variety of ways with differing degrees of effectiveness. First, if possible, do all your drilling, sawing, or cutting before the wood is treated. If this is not possible, spray, brush, dip, or soak the wood in a preservative solution following cutting. Of these methods, spraying is the least effective; soaking is best. Generally, regardless of the original preservative, oilborne materials such as penta concentrate, copper naphthenate, or creosote will be used for touchup because they are widely available. When concentrated solutions of a preservative must be diluted, follow the label directions on the container and use the lightest oil possible; mineral spirits are frequently very satisfactory. When the touchup is by spray or brush, apply the preservative heavily, to the point of runoff.

Natural Durability

The heartwood of a few tree species is naturally resistant to attack by wood-destroying organisms. Heart-

wood is usually dark and is found in the center of the tree stem. Its darkness is caused by chemicals called extractives that impart a natural resistance to attack. Some species of trees have a considerable natural resistance to attack owing to high quantities of these chemicals in the wood. In contrast, the light-colored sapwood of the tree has virtually no natural resistance; it will deteriorate rapidly under conditions favorable to the growth of wood-destroying organisms. The problem with nonresistant sapwood is further complicated because the heartwood and sapwood of some species are practically indistinguishable. Also, the trees being cut today have a much smaller percentage of heartwood than did the old-growth trees of yesteryear.

Southern species which have attack-resistant heartwood include the cedars, black locust, red mulberry, osageorange, and old-growth cypress (see box).

Concepts of Wood Durability are Changing

Old growth bald cypress was once considered a highly durable species. Research has shown that today's second growth cypress is not naturally durable.

Wood cut from several western trees, including redwood and western red cedar, is often considered to be naturally durable. However, when these species are used in the South, the durability of the wood is, at best, variable. Much of the wood cut from these species will decay or succumb to termites in just a few years.

Preservative Toxicity

Many of the preservative chemicals discussed in this publication are active on humans and plants as well as on wood-destroying organisms. This activity ranges from simple skin irritation to a highly poisonous reaction.

The Environment Protection Agency (EPA) regulates the use of pesticides, including wood preservatives. In addition to determining when, where, and how these chemicals may be used, EPA decides whether a chemical on a treated wood product will be available for sale to the general public. Presently, creosote, penta, and copper naphthenate are the most readily available preservatives for home application.

Part of the problem which the EPA is trying to solve by restricting availability is the misuse of toxic chemicals by untrained persons. Pesticide users should take care to insure that the safety precautions and use instructions on the container are followed **exactly**. Depending on the chemical, protective measures such as rubber gloves, respirators, and protective clothing may be needed. Also, carefully dispose of excess or outdated chemicals and the containers in which they were packed. Even small amounts of these chemicals may severely contaminate large areas of

water supplies if handled improperly. Read the label for instructions on the proper disposal of containers.

Take special precaution around any treating plant, even a small community-sized operation. Earth dams and settling ponds must be constructed to contain any spillage that might occur. Warn your employees of the dangers of the chemicals with which they are working; train workers to use these materials correctly. To avoid customer dissatisfaction, the operator of the plant should make sure that the preservative used in a customer's order is the proper one for the intended uses of the wood.

As EPA's control over preservative chemicals tightens, all treating plant operators and many other users will find it necessary to become certified applicators. In the near future, the most effective (and most toxic) preservatives will be available only to those who possess a license. These applicator licenses are issued by the States upon successful completion of a qualification examination. For more information on these exams and licensing requirements, check with your county agricultural extension agent.

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PROTECT

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